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| PATTERSON & SHERIDAN, LLP - - APPM/TX 3040 POST OAK BOULEVARD, SUITE 1500 HOUSTON, TX 77056 | | | | GAMBETTA, KELLY M |
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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte SESHADRI GANGULI, KAVITA SHAH,
NIRMAYA MAITY, and MEI CHANG

Appeal 2009-006458
Application 10/811,230
Technology Center 1700

Before TERRY J. OWENS, PETER F. KRATZ, and
JEFFREY T. SMITH, *Administrative Patent Judges*.

SMITH, *Administrative Patent Judge*.

DECISION ON APPEAL¹

¹ The two-month time period for filing an appeal or commencing a civil action, as recited in 37 C.F.R. § 1.304, or for filing a request for rehearing, as recited in 37 C.F.R. § 41.52, begins to run from the “MAIL DATE” (paper delivery mode) or the “NOTIFICATION DATE” (electronic delivery mode) shown on the PTOL-90A cover letter attached to this decision.

STATEMENT OF THE CASE

The Appellants appeal under 35 U.S.C. § 134(a) from the Examiner's rejection of claims 1, 2, 4-7, 9-14, 16, 17, 19, 20, 22-25, 27, 28, 30-33, 35-38, 40-42, 44-46, 48-51, and 53-67, all of the pending claims. We have jurisdiction under 35 U.S.C. § 6(b).

The Invention

Appellants' invention is directed to a method of forming a film on a substrate surface, comprising exposing the substrate surface to a compound selected from the group consisting of bis(dialkylpentadienyl)ruthenium compounds, bis(alkylpentadienyl)ruthenium compounds, bis(pentadienyl)ruthenium, and combinations thereof. (Spec. [0017]).

Claim 1 is illustrative:

1. A method for forming a ruthenium material on a substrate surface, comprising:

positioning a substrate within a process chamber;

exposing a ruthenium-containing compound to the substrate while forming a ruthenium-containing compound film thereon, wherein the ruthenium-containing compound is selected from the group consisting of bis(dialkylpentadienyl) ruthenium compounds, bis(alkylpentadienyl) ruthenium compounds, bis(pentadienyl) ruthenium compounds, and combinations thereof;

purging the process chamber with a purge gas;

exposing a reducing gas comprising ammonia and atomic hydrogen to the ruthenium-containing compound film on the substrate while forming a ruthenium layer thereon; and

purging the process chamber with the purge gas.

The Examiner relied on the following references in rejecting the appealed subject matter:

| | | |
|-----------------|-----------------|---------------|
| Kawano et al. | 6,605,735 B2 | Aug. 12, 2003 |
| Aaltonen et al. | 2003/0165615 A1 | Sept. 4, 2003 |

Claims 1, 2, 4-7, 9-14, 16, 17, 19, 20, 22-25, 27, 28, 30-33, 35-38, 40-42, 44-46, 48-51, and 53-67 stand rejected under 35 U.S.C. § 103(a), as unpatentable over the combined teachings of Aaltonen, Kawano and Admitted Prior Art (Spec. [0068] -[0069]).

OPINION

During examination, the Examiner bears the initial burden of establishing a prima facie case of obviousness. *In re Oetiker*, 977 F.2d 1443, 1445 (Fed. Cir. 1992). “[R]ejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.” *KSR Int’l Co. v. Teleflex, Inc.*, 550 U.S. 398, 418 (2007) (quoting *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006)). “[T]he analysis that ‘should be made explicit’ refers not to the teachings in the prior art or a motivation to combine, but to the court’s analysis.” *Ball Aerosol & Specialty Container, Inc. v. Ltd. Brands, Inc.*, 555 F.3d 984, 993 (Fed. Cir. 2009).

The Examiner found that Aaltonen discloses an ALD (atomic layer deposition) process for producing a ruthenium layer onto a substrate. The Examiner recognized that Aaltonen differs from the claimed invention by employing different ruthenium precursors. (Ans. 5). The Examiner determined that Kawano discloses a CVD process that employs ruthenium

compounds that provide the benefit of low temperature deposition and ease of supplying a precursor gas. (*Id.*) The Examiner found that it would have been obvious to utilize the ruthenium compounds of Kawano in the ALD process of Aaltonen to obtain the advantages described by Kawano. The Examiner also recognized that both Aaltonen and Kawano did not disclose the claimed reducing agent. (Ans. 6). The Examiner reasoned that, based on Appellants' disclosure (Spec. [0068], [0069]), the claimed reducing agents were traditional reducing agents and therefore it would've been obvious to utilize these traditionally accepted reducing agents in the process of Aaltonen. (*Id.*).

The Examiner contends that the carbonylbis(dialkylpentadienyl) ruthenium compound of Kawano is the same as, or is encompassed by, the ruthenium compound required by independent claims 1, 11, 19, 27, 36, 44, 54, and 55. (Ans. 5-7). As to claims 1, 19, 27, 36, and 44, we agree with the Examiner that the claimed ruthenium containing compound, e.g., bis(dialkylpentadienyl) ruthenium compound, reads on the carbonylbis(dialkylpentadienyl) ruthenium compound of Kawano. However, we agree with Appellants that the Examiner has not adequately accounted for all of the elements of independent claims 1, 11, 19, 27, 36, 44, 54, and 55. We agree with Appellants that the ruthenium compound of Kawano is not the same as the bis(2,4 dimethylpentadienyl) ruthenium as recited in claims 11, 54, and 55. (Reply Br. 5). We also agree with Appellants that the Examiner has utilized hindsight to provide a reason for using a combination of reducing agents required by claims 1, 11, 19, 27, 36, 44, 54, and 55. (App. Br. 14-15, 22-23; Reply Br. 6). Furthermore, Aaltonen discloses there is difficulty in determining suitable reducing agents

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for ALD processes. (Aaltonen [0008]-[0012]). Thus, Aaltonen utilizes specific reducing agents in the described process. In light of the above recognized disadvantages, the disclosure that reducing agents are traditional would not have led a person of ordinary skill in the art to utilize the claimed reducing agent in the process of Aaltonen.

Appellants also argue that the subject matter of claims 19, 27, 44, 54, and 55 is additionally distinguished from the combination of Aaltonen and Kawano because of the barrier layer (claims 19 and 55), the low-k layer (claims 44 and 54) and the dielectric layer (claim 27). (App. Br. 15-16, 20-21 and 24). The Examiner has failed to provide a reason for utilizing the claimed barrier layer, low-k layer, and dielectric layer required by the claimed invention. Finally, we agree with Appellants that the Examiner has not accounted for the ruthenium containing compound of claim 36. (App. Br. 23).

For the reasons set forth above and those presented by Appellants in their Briefs, we reverse the rejections of claims 1, 2, 4-7, 9-14, 16, 17, 19, 20, 22-25, 27, 28, 30-33, 35-38, 40-42, 44-46, 48-51, and 53-67.

DECISION

The Examiner's rejection of claims 1, 2, 4-7, 9-14, 16, 17, 19, 20, 22-25, 27, 28, 30-33, 35-38, 40-42, 44-46, 48-51, and 53-67 is reversed.

REVERSED

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